

L8(4.5) Factoring Special Quadratics (Perfect Square Trinomials & Differences of 2 Squares)

1. Perfect Square Trinomial

$$(a) a^2 + 2ab + b^2 = (a + b)(a + b)$$

$$= (a + b)^2$$

$$(b) a^2 - 2ab + b^2 = (a - b)(a - b)$$

$$= (a - b)^2$$

Remember

$1 \times 1 =$	1
$2 \times 2 =$	4
$3 \times 3 =$	9
$4 \times 4 =$	16
\vdots	\vdots
$12 \times 12 =$	144

Note:

- Standard methods, such as **algebra-tiles** or **decomposition (SPI or MAN)** will also work, but may take longer.
- It is critical to check the **2ab** term to make sure you have a perfect square, or verify your final answer by expanding.

Ex.1 Factor using a pattern (if possible)

$$(a) x^2 + 6x + 9$$

$$= x^2 + 3x + 3x + 9$$

$$= x(x+3) + 3(x+3)$$

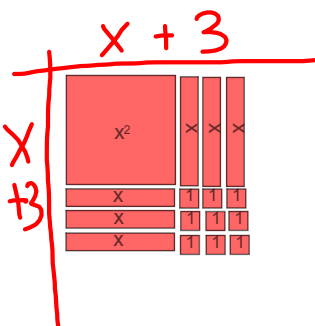
$$= (x+3)^2$$

M:

A:

N:

$9 \Rightarrow 3 \times 3$
 $6 \Rightarrow 3 \text{ and } 3$



$$(b) 4x^2 - 12x + 9$$

$$= 4x^2 - 6x - 6x + 9$$

$$= 2x(2x-3) - 3(2x-3)$$

M:

A:

N:

$36 \Rightarrow \sqrt{a} \text{ and } \sqrt{c}$
 $\sqrt{9} \quad \sqrt{4}$
 3×2

Short cut
 $\boxed{x^2}$ cut

$$(c) 25x^2 - 30x + 9$$

$$(5x-3)(5x-3)$$

M:

A:

N:

Ex.1 Factor using a pattern (if possible)

(a) $x^2 + 12x + 36$

$$= (x + 6)(x + 6)$$
$$= (x + 6)^2$$

(b) $x^2 + 13x + 36$

$$= (x + 9)(x + 4)$$

(c) $4x^2 - 20x + 25$

$$= (2x - 5)(2x - 5)$$
$$= (2x - 5)^2$$

2. Difference of Squares

$$a^2 - b^2 = (a + b)(a - b)$$
$$= (a - b)(a + b)$$

(the order of the binomials
does not matter)

Examples:

$$\begin{array}{l} 2 \times 4 \\ 4 \times 2 \end{array}$$

(a) $4x^2 - 9$

$$= (2x - 3)(2x + 3)$$

(b) $9x^2 - 16$

$$= (3x - 4)(3x + 4)$$

Ex.2 Factor

(a) $k^2 - 121$

$$(k-11)(k+11)$$

(b) $81m^2 - 144$

$$\begin{aligned}
 &= 9(9m^2 - 16) &= (9m+12)(9m-12) \\
 &= 9(3m+4)(3m-4) &= 9(3m+4)(3m-4)
 \end{aligned}$$

Ex.3 Factor using a special pattern:

(a) $25d^2 - 144$

(b) $16x^2 + 24xy + 9y^2$

$$\begin{aligned}
 &= (4x+3y)(4x+3y) \\
 &= (4x+3y)^2
 \end{aligned}$$

(c) $18p^2q - 60pq + 50q$

(d) $98a^2 - 32b^2$

$$\begin{aligned}
 &= 2q(9p^2 - 30p + 25) &= 2(49a^2 - 16b^2) \\
 &= 2q(3p-5)(3p-5) &= 2(7a-4b)(7a+4b) \\
 &= 2q(3p-5)^2
 \end{aligned}$$

Ex.4: Factor $x^2 - 10x + 25 - w^2$

Assigned Work:

p. 230-231 # 3bc, 5, 6, 7, 10, 11, 14